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ELECTRICAL WIRING

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2018
MODEL YEAR

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Vehicle Specific Information

See *SVE Bulletins* and the *Body Builder Layout Book* at www.fleet.ford.com/truckbbas.

ELECTRICAL WIRING
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ELECTRICAL WIRING GENERAL INFORMATION

Super Duty F-Series and selected E-Series Super Duty vehicles are equipped with a number of conveniently located electrical wiring taps. Most taps are fused, having locations under the instrument panel, in the engine compartment, and at the rear of the frame. Illustrations, schematics and a wiring harness for Trailer Tow is provided in a cardboard box shipped with each vehicle if not already equipped with a factory installed Trailer Brake Controller. The circuits at the rear of the frame are provided to support trailer wiring requirements or the Second Unit Body (SUB) additions. The E-Series and Super Duty F-Series Circuit charts have a brief description of each circuit function, wire gauge, color code and electrical schematic.

1. The Ford starting and the charging system should not be altered.
2. The completed vehicle total electrical load must not exceed the maximum output of the alternator.
3. Do not route or attach electrical wires to fuel lines.
4. Engine compartment wiring must not be rerouted in any manner.
5. The 6.4L diesel engine requires two batteries wired in parallel for proper starting operation and must not be isolated. Do not modify the Glow Plugs Power Circuits.
6. Ford recommends that all additional underhood and underbody wiring:
   - Be cross-linked polyethylene, or equivalent, high temperature insulation wire 125° C [257° F] minimum rating.
   - Meet SAE specifications J1128 type SXL, GXL or TXL.
   - Meet SAE J1127 type SGX or STX for battery cables.
   - Be protected with nylon convoluted tubing.
   - Be located so as to avoid or minimize restriction of airflow through the engine compartment, underbody and fuel system.
   - Be of sufficient length to be properly routed, so as not to interfere with operating zones of such components as throttle or transmission linkage.
   - Not be routed near the exhaust system or any other source of high heat; melted insulation can result in electrical shorts and system failure.
   - Be routed away from hostile surfaces and sharp edges and be secured in its intended location.
   - Be protected by rubber grommets when it passes through body or frame openings. Use customer access pass-thru circuits provided on E-Series and Super Duty F-Series to avoid additional openings between passenger and engine compartments.
   - Be protected from electrical shorts by fuses or circuit breakers.
   - Be routed at least 38 mm [1.5 in] away from engine.
7. Interior wiring not exposed to high temperatures may be SAE approved, general purpose wire.
8. Ground the second unit body to the frame in at least two locations, and if required, add an additional frame to engine ground cable to improve the ground path to the battery.
9. Splicing into circuitry relating to the powertrain control systems is not acceptable because of the adverse effect on the electrical system operation.
10. Batteries must be disconnected before welding to body and chassis components. Note that disconnecting the batteries will result in a memory loss on electronic engine/transmission controlled vehicles. The vehicle will require several miles of driving in various driving modes to restore its memory and regain optimum operating conditions.
11. Electrical connections exposed to the elements should be appropriately protected.
12. Do not ground the body to the transmission or transmission crossmember.
13. Ignition circuit of any engine should not be altered.
14. Alternator circuit wiring must not be altered by cutting, soldering or splicing.
15. Some head lamps are plastic and have protective coatings which can be damaged by solvents or tape. Refer to the Owner's Guide for proper cleaning procedures.
16. E-Series has (2) 12 gage pass-thru circuits located in the cabin above the driver-side kick-panel in a 6-pin connector (F7UB-14A41-B) and found in the engine compartment at the 4-pin connector (F4UB-14A411-A) in a harness below the cowl, outboard of the brake master cylinder.

    Super Duty F-Series has (4) 14 gage blunt-cut pass-thru circuits located in the cabin within a bundle located on the passenger side cowl under and outboard of the glove box; the wires pass through the dash panel to the engine compartment and are found just below the Engine Control Module.

    These circuits provide an unfused means to interface wiring between the cabin and the engine compartment without drilling through the dash panel. See vehicle model sections of the Body Builder Layout Book and SVE Bulletins for further information regarding pass-thru circuits.
17. Center High Mounted Stop Lamp (CHMSL) wiring taps are provided on E-Series Super Duty Cutaway/Stripped Chassis and Super Duty F-Series Chassis Cab vehicles. Super Duty F-Series CHMSL circuits are located in the customer access connector in the RH cowl side under the glove box. For 2018 model year, Super Duty F-Series also has a CHMSL circuit located on the driver's side rear frame.
18. Electrical bulbs are listed in the Owner's Manual Bulb Chart. Check for the "DOT" marking on the bulb base which means the bulb meets U.S. "DOT" standards. Bulbs without the "DOT" marking or that produce different colors other than the original bulbs as listed in the bulb chart, may affect the lamp's light output, aim, glare and your safety; in addition, such bulbs may burn out early or damage the lamp.
19. Super Duty F-Series vehicles are equipped with a clean tachometer output (CTO) wiring tap. The tap is designated circuit CE913 (BU) and is located on the passenger side cowl under and outboard of the glove box. This tap should be used if a tachometer signal is required. The signal is digital and requires a digital tachometer. The signal pulse rate is half the number of engine cylinders per revolution (i.e., 4 for 6.2L gasoline and 6.7L diesel, 5 for 6.8L gasoline).

    E-Series vehicles are also equipped with CTO wiring tap. The tap is designated circuit CE913 BU and is located under hood near the PCM connector.
20. Super Duty F-Series & E-Series vehicles are also equipped with a vehicle speed out (VSO). The VSO tap is designated circuit VMC05 (VT/OG). The Super Duty F-Series tap is located on the passenger side cowl under and outboard of the glove box; the E-Series tap is located under dash near the parking brake pedal. The VSO tap signal frequency is 2.22 times the vehicle speed in miles per hour.

Vehicle specific electrical information in SVE Bulletins can be accessed via the web at: www.fleet.ford.com/truckbbas under the "Bulletins" tab.

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ELECTRICAL WIRING
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ADDITION OF LIGHTS OR ELECTRICAL DEVICES

This section provides instructions for the addition of electrical devices to the vehicle electrical system by body builders.

Vehicles stored on site should have the negative battery cable disconnected to minimize a "Dead Battery" situation. This applies to both "incomplete" and "complete" vehicles in storage.

After all electrical or vehicle modifications, perform on-board diagnostics to the Body Control Module (BCM). Road test vehicle and re-run the on-board diagnostics to verify that no DTCs are present. If DTCs are generated perform the appropriate diagnostic procedures and repairs. Vehicle operation (engine, transmission and vehicle lighting) may be affected if DTCs are not serviced.

F/CMVSS, U.S. and Canadian RFI Requirements

1. All Ford vehicles built and fully completed by Ford comply with F/CMVSS No. 108, "Lamps, Reflective Devices and Associated Equipment" and other applicable F/CMVSS that affect electrical components. Care must be taken that modifications do not conceal, alter or change components installed or provided by Ford Motor Company to achieve this conformance.
2. Incomplete vehicles (i.e., Chassis Cab, Stripped Chassis, etc.) will conform to the F/CMVSS according to the provisions and conditions stated in the Incomplete Vehicle Manual (IVM) attached to each incomplete vehicle.
3. Devices that emit radio frequency (RF) energy, such as AM/FM radios and radio-controlled security systems, marketed for sale or use in the United States are subject to the rules and regulations of the Federal Communications Commission (FCC) 47 CFR Parts 2 and 15.

   These rules specify the following conditions of operation:

   This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
   (1) This device may not cause harmful interference, and
   (2) this device must accept any interference received, including interference that may cause undesired operation.

   In addition, the FCC's Rules may require the device to be tested and found to comply with various RF interference emission limits before it may be marketed. The FCC establishes different limits according to the particular use and installation of RF devices. In some cases, a grant of equipment authorization from the FCC also must be obtained before any RF device may be marketed. Labeling with certain FCC information may also be required. To ensure continued compliance with the FCC's requirements, the owner, user, custom manufacturer, or service technician must not modify or change the RF device in a manner not expressly approved by Ford Motor Company. Such modifications could void the authority to operate the device.
4. All vehicles powered by spark ignition internal combustion engines (e.g., gasoline or liquid petroleum gas engines) and manufactured in Canada or for sale or use in Canada are subject to the Canadian "Regulations for the Control of Interference to Radio Reception" per Interference-Causing Equipment Standard (ICES-002) and applicable test method according to "CAN/CSA-C108.4-M06". Violation of these regulations is punishable by fine or imprisonment. Ford-built incomplete vehicles other than stripped chassis are designed and manufactured to be capable of meeting the regulatory requirements or such modifications thereof as may be authorized by the Canadian Department of Communications. However, because Ford has no control over how an incomplete vehicle is completed by subsequent stage manufacturers, Ford does not represent that the completed vehicle incorporating the Ford-built components will comply with applicable requirements.

Routing & Clipping

1. It is strongly recommended that wiring in areas of heavy rework, or in areas where welding operations are to be performed, be removed prior to the rework operations and reinstalled after the rework is completed. The Instrument Panel (IP) cluster, Power Control Module (PCM) and Body Control Module (BCM) must be disconnected before any electrical welding is performed, otherwise module damage may result. If wire removal is not practical, the wires must be shielded from damage due to the rework and welding heat. All components and wiring should be reinstalled as closely as possible to the way it was installed before removal.
2. Wire routings of newly installed components or wire routing revisions of the Ford harnesses necessitated by reworks must conform to the following:
   - Wires routed through holes in sheet metal or castings must have the hole edges protected by a grommet.
   - Wires should be routed to avoid metal edges, screws, trim fasteners and abrasive surfaces. When such routings are not possible, protective devices (shields, caps, etc.) must be used to protect the wires and when wires must cross a metal edge the edge should be covered with a protective shield and the wiring fastened within 3 inches of the edge.
   - Wires must be routed to provide at least 3 inches clearance to moving parts, unless positively fastened or protected by a conduit.
   - Existing heat shields, insulation, and wire shielding/twisting must be maintained.
   - Wire routings should avoid areas where temperatures exceed 85° C [180° F] and a minimum clearance of 231 mm [6 in] should be maintained from exhaust system components. Where compliance with this requirement is not possible, high temperature insulation and heat shields are required.
   - When wiring is routed between two members where relative motion can occur the wiring should be secured to each member, with enough wire slack to allow flexing without damage to the wire.
   - Wiring to all circuit components (switches, relays, etc.) in exposed locations must provide a drip loop to prevent moisture from being conducted into the device via the wire connection.
   - Routing wires into areas exposed to wheel wash should be avoided. When such routings cannot be avoided, adequate clipping or protective shields are required to protect the wires from stone and ice damage.
   - The wire retainers and grommets installed by the assembly plant are usually designed to accommodate only the Ford-installed wires. Additional wiring or tubing should be retained by additional clips. When added wires or tubes are routed through sheet metal panels, new holes, with proper wire protection and sealing, must be used.
   - All wiring connections to components of the factory-installed system must be accomplished by using the proper mating wire termination. (Connections on studs and ground connections must use eyelet terminations, connections to female bullets must terminate in male bullets, etc.)

Splice/Repair

When necessary to splice wire for repair or circuit length revisions, the following guide should be followed:

- Wire ends should be stripped making sure that individual conductor strands are not damaged.
- When soldering, make sure an adequate mechanical joint exists **before** applying solder. Use only rosin core solder — **never** acid core.
- For crimp joints, use butt-type metal barrel fasteners and a proper tool (such as Motorcraft crimp tool S-9796) specifically designated for this type of work.
- Splice joints must be adequately sealed and insulated. Adhesive-lined heat shrink tubing is highly recommended to cover soldered and bare metal barrel crimp joints.
- The most durable splice joint will be bare metal barrel crimped, flow-soldered and covered with adhesive lined heat shrink tubing. This is recommended as the preferred splice joint.

Circuit Protection

1. Modification to existing vehicle wiring should be done only with extreme caution and consideration of effects on the completed vehicle electrical system. Anticipated circuitry should be studied to ensure that adequate circuit protection will exist and that feedback loops are not created.
2. Any added circuitry must be protected by a fuse or circuit protection device installed by the bodybuilder.
3. **Never** drive additional electrical load directly from the Body Control Module (BCM) output. The BCM output must drive an auxiliary relay coil only. If you try to drive an aftermarket electrical load directly, the BCM will likely disable the output and you may have to replace the BCM.
4. Never increase the rating of a factory installed fuse or circuit breaker.
5. For added lamp loads, the "Bulb Chart" on a following page will aid in determination of common lamp current draws.
6. It is the body builder's responsibility to use sound engineering judgment when making any modifications to a vehicle, and the body builder is responsible for ensuring that all modifications made are appropriate for the intended vehicle application.

Guidelines for Powertrain Control System Application

All Powertrain Control Module (PCM) wiring, in particular the 12A581 and 14401, must be a minimum of 51 mm [2 in] from secondary ignition coil wires and at least 102 mm [4 in] from the distributor, ignition coil tower, starter motor and starter motor wiring as well as 102 mm [4 in] from the alternator output wiring. These clearances apply in particular to all PCM sensor and actuator pigtail wiring. PCM wires shall not be in the same bundle as other high-current non-PCM circuits (e.g., tachometer wire from coil to Thick Film Ignition Module (TFI), power seat/ door lock/window, horn, alternator regulator) for a distance of more than 20 inches.

Vehicle specific electrical information in SVE Bulletins can be accessed via the web at: www.fleet.ford.com/truckbbas under the "Bulletins" tab.

NOTE: The final stage manufacturer is responsible for ensuring that the final vehicle configuration meets all applicable regulatory requirements.

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ELECTRICAL WIRING
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ADDITION OF LIGHTS OR ELECTRICAL DEVICES (Cont'd)

Modern Ford vehicle electronic controls provide Ford customers with superior reliability and diagnostic capability when vehicle modifications are performed in line with the recommendations detailed here. Many traditional modification methods may no longer be compatible with these modern electronic modules.

Although there are many points in the truck electrical system to connect additional circuits certain connection points are recommended for reliability and convenience. This section defines the recommended connection points for each Ford Truck model and the maximum electrical loads allowable.

CAUTION: Improper electrical tie-ins may affect vehicle operation (i.e., engine, transmission, lighting).

After all electrical or vehicle modifications, perform the on-board diagnostics procedures as described in the powertrain control/emissions diagnosis manual to clear all diagnostic trouble codes (DTCs). In addition, perform self-test to the BCM and test all lighting outputs. Road test vehicle and rerun the on-board diagnostics to verify that no DTCs are present. If DTCs are generated, perform the appropriate diagnostic procedures and repairs. Vehicle operation (engine, transmission, lighting) may be affected if DTCs are not serviced. Alternative connections or wiring practices are not recommended as these modifications will result in other circuits becoming non-functional. Disconnect the battery negative (ground) cable and remove it from the battery carrier prior to any vehicle modification. Upon completion of body or equipment installation, all wiring should be checked for proper routing, etc. to preclude electrical shorts upon re-installation of the battery negative cable. Do not splice into the Powertrain System (PCM-V). Connecting to any component or wires to this system may adversely affect engine/transmission operation. Likewise, do not splice into any lighting circuits as this may permanently disable the lighting circuits within the Body Control Module (BCM). Proper modification practices are fully described in this layout book.

LIGHTS CONTROLLED BY HEADLAMP SWITCH

• Super Duty F-Series

The headlamp switch used on the Super Duty F-Series vehicles is a low current switch designed to signal the Body Control Module (BCM) and Aux Lighting Module BCMB to activate all exterior lighting. For halogen lamp vehicles, the left-hand and right-hand High and Low beam headlamps are controlled individually by FETS in the BCM for the upper lamps and BCMB for the lower lamps. For LED lamp vehicles, the left-hand and right-hand High and Low beam headlamps are controlled individually by FETS in the BCM that interface with a module integrated in the headlamp assembly. DRL and lamp outage are controlled by dedicated circuits between the lamp assembly and the BCM.

A connection to any circuit in the system controlled by the headlamp switch must be done using an auxiliary relay. Any connection must be performed on the lighting output of the BCM. Additional loads connected to the headlamp switch will damage the headlamp switch.

• E-Series

Rear Lights — Splice into circuit CLS 30 VT/WT in crossover harness at rear of vehicle.

Front Lights — Splice into circuit CLS 30 VT/WT in engine compartment 12A581 wire assembly along right or left fender apron.

LIGHTS CONTROLLED BY STOP LAMP SWITCHAND TURN INDICATOR SWITCH

NOTE: Splicing into the stop lamp switch can damage the Body Control Module (BCM). Splicing into the stop lamp switch on vehicles with Electronically Controlled Transmissions can interfere with the proper functioning of PCM, speed control, and anti-lock brake electronic modules. This can:

- Affect EFI engine idle speed quality.
- Prevent the Powertrain Control Module (PCM) controlled torque converter clutch from applying at throttle openings less than half-throttle.
- Deactivate anti-lock brake system operation.
- Prevent the speed control from disengaging upon braking.

Do not delete or deactivate the Center High Mount Stop Lamp (CHMSL) unless it will be blocked by second unit body.

The stop lamp switch that is in use on Ford trucks is a mechanical switch operated by brake pedal. The BCM supports adding loads to the brake pedal switch through fuse #04 at pins C1-13 and C7-7. Tapping into other BCM inputs, such as Park Brake and Door Ajar, can cause BCM failure. Under no circumstances are additional brake pedal loads to be added by directly splicing into vehicle wiring.

F-150, SUPER DUTY F-SERIES AND E-SERIES MODELS

Ford trucks are released with a mechanical stop lamp switch mounted on the brake pedal arm for E-Series and mounted on the pedal pin and master cylinder push rod for F-150 and Super Duty F-Series. If only stop lamp function is desired for the added lights, connect to circuit CBP04 VT at the customer access connector on the RH cowl side.

The turn signal switch is designed to use a low current to signal the BCM to activate turn signal and stop lamps. The switch is not designed to directly power any lamps or other electrical devices.

If both turn signal and stop lamp function are desired for the added lights, splice into Super Duty F-Series trailer tow wiring provided with the vehicle. These circuits are provided as standard equipment and are located at the rear of the vehicle. Do not splice into turn/stop circuits at the BCM or turn circuits at the multi-function switch. Splicing in those areas will damage the switch or cause the BCM to malfunction. Use the trailer tow circuits and trailer tow relays to power added turn/stop lights. Circuits are accessible at the rear of the vehicle; LT/Stop/Turn=YE, RT/Stop/Turn=GN.

Reverse/back-up lights must be tied-in using trailer tow relays and circuits in same manner as turn/stop lights.

ADDED LIGHTS OR ACCESSORIES CONTROLLED BY ADDED SWITCHES

This section describes the connection points for added electrical accessories when these accessories are to be controlled by added switches not a part of the Ford-released vehicle. The added switches and wiring must have sufficient electrical capacity for the accessory load and must be tied to the battery using separate fuses and a circuit protection device. Additional loads on Ford provided fuses may cause permanent BCM damage and lighting failure. Also, added current draw must not cause total loads to exceed capabilities of the base vehicle wiring.

WIPER DELAY MODULE – E-SERIES, F-53 & F-59 STRIPPED CHASSIS

The Wiper Delay Module is not internally protected for a continuous high current load greater than 9 amps and must be protected either internal to the wiper motor or via inline protection such as a properly sized circuit breaker. The existing 30 amp fuse in the fuse panel is sized for the maximum allowable in-rush current and does not provide appropriate protection to the Wiper Delay Module.

MALFUNCTION INDICATOR LIGHT (MIL)

The “Malfunction Indicator Light” is used to indicate malfunctions of the engine’s emission control system and certain powertrain emissions-related components. For all incomplete vehicles, except Basic (Stripped) Chassis (which is not equipped with an instrument panel), the MIL is Ford-installed and operational in the instrument panel. The E-Series Basic (Stripped) Chassis vehicle has the MIL warning light installed in the instrument cluster, which is shipped in the dunnage box.

If an alternate instrument cluster is utilized, the final stage manufacturer must install an operational MIL in the instrument cluster. The MIL must be located on the driver’s-side instrument panel, be of sufficient illumination and location to be readily visible under all lighting conditions and shall be amber in color when illuminated. The MIL, when illuminated, shall display the phrase “Check Engine” or “Service Engine Soon”. The word “Powertrain” may be substituted for “Engine” in the previous phrases. Alternatively, the ISO engine symbol may be substituted for the word “Engine” or for the entire phrase. This is a requirement for emission certification.

Once the light has been completed by the final stage manufacturer, proper function can be determined by turning the key to the on position. The light should come on prior to engine cranking and go out when the engine starts.

RADIO FREQUENCY INTERFERENCE (RFI)

During modifications to the vehicle, manufacturers, service technicians, owners and users should take the necessary precautions to maintain the RFI integrity of components. Both the United States and Canada have RFI regulation in effect. For any completed vehicle, additional measures may be needed to adequately suppress RFI emissions. Affected components could include spark plugs, ignition wires, ignition coils, ground straps, ignition components shields, accessory drive belts, ignition coil suppressors, the Powertrain Control Module (PCM) and the Body Control Module (BCM). Guidance for installing two-way mobile radios can be found via the web at www.fordemc.com/docs download/Mobile_Radio_Guide.pdf.

Vehicle specific electrical information in SVE Bulletins can be accessed via the web at: www.fleet.ford.com/truckbbas under the “Bulletins” tab.

NOTE: The final stage manufacturer is responsible for ensuring that the final vehicle configuration meets all applicable regulatory requirements.

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ELECTRICL LOAD LIMITATIONS

If the **total** electrical load on a factory circuit, after the addition of electrical equipment, is less than 80% of the fuse or circuit breaker protection rating in that circuit or less than the capacity of some limiting component (switch, relay, etc.), the items to be added can be connected directly to that circuit. For fuses located in the engine compartment, the electrical load should not exceed 60% of the fuse or circuit breaker protection rating. If the total electrical load to be added on a factory circuit exceeds the value of the circuit protection, or the value of some limiting component, the items to be added **cannot** be added directly to the circuit.

- Additional loads cannot be driven by the Body control Module (BCM), they must be driven by an auxiliary relay. The coil of the relay can be fed from the factory wiring (now acting as a signal circuit) with the added wiring providing the power feed to the added electrical device through the relay power contacts. (The relay selection is important and depends on current requirements, number of cycles expected in the relay lifetime, whether the relay is to be operated intermittently or for long periods of time, and whether the relay is exposed to weather conditions or is installed in a protected area. When the current requirements of a circuit exceed the capacity of an available relay, more than one relay can be used if the circuit is wired to split the load).
- The factory wiring should not be used as a power feed to the relay power contacts or switches. Battery power is to be supplied from the starter motor solenoid positive terminal for added circuits requiring a maximum of 30 amps or directly from the battery positive terminal for added circuits requiring greater than 30 amps of current.

Caution: Never use the stud on the underhood fuse panel as a junction point.

Circuit protection (fuses or circuit breakers) must be provided for all added wiring. The protection device rating should not exceed the current requirements for the add-on components and should be installed as close to the point of tapped power as possible.

Wire Gage

1. When adding wiring, the wire gage size should be determined as follows:
   - Where wire is spliced to extend a circuit, the added wire should have a gauge at least that of the circuit being lengthened.
   - When wire is being added to feed add-on devices, the Wire Gage Table on this page should be used.

   NOTE: The current capacity of a given wire varies with temperature and type of insulation. The table, however, represents generally accepted values as a guide.
2. All added underhood or underbody wiring should have a thermostat insulation (such as Hypalon or Cross-linked polyethylene).

   The following specifications typically apply:
   - SAE specifications J1128 type SXL, GXL or TXL except for battery cables
   - SAE specifications J1127 type SGX or STX for battery cables.

WIRE GAGE TABLE

Wire Gage	Maximum Current Capacity (Plastic Insulated Copper Wire)
20	10 Amps
18	15 Amps
16	20 Amps
14	25 Amps
12	30 Amps
10	40 Amps

BULB CHARTS

BULB TRADE NUMBER	CANDLE POWER	CURRENT @ RATED VOLTAGE
67/97	4	0.69 A @ 13.5V
168	3	0.35 A @ 14.0V
192	3	0.33 A @ 13.0V
194	2	0.27 A @ 14.0V
211-2	12	0.97 A @ 12.8V
212-2	6	0.74 A @ 13.5V
578	9	0.78 A @ 12.8V
579	9	0.8 A @ 12.8V
904	4	0.69 A @ 13.5V
904NA	5.3	0.69 A @ 13.5V
906	6	0.69 A @ 13.5V
912	12	1.0 A @ 12.8V
916	2	0.54 A @ 13.5V
916NA	1.5	0.54 A @ 13.5V
921	21	1.4 A @ 12.8V
922	15	0.98 A @ 12.8V
1157A (major)	24	2.1 A @ 12.8V
1157A (minor)	2.2	0.59 A @ 14.0V
3057 (major)	32	2.1 A@ 12.8V
3057 (minor)	32	2.1 A @ 12.8V
3057K (major)	32	2.1 A @ 12.8V

BULB TRADE NUMBER	CANDLE POWER	CURRENT @ RATED VOLTAGE
3057K (minor)	2	0.48 A @ 14.0V
3155K	21	1.6 A @ 12.8V
3156 (P27W)	32	2.1 A @ 12.8V
3157 (P27/2W) (major)	32	2.1 A @ 12.8V
3157 (P27/2W) (minor)	3	0.59 A @ 14.0V
3157A (major)	24	2.1 A @ 12.8V
3157A (minor)	2.2	0.59 A @ 14.0V
3157K (major)	32	2.1 A @ 12.8V
3157K (minor)	3	0.59 A @ 14.0V
3456K	40	2.23 A @ 12.8V
3457AK (major)	30	2.23 A @ 12.8V
3457AK (minor)	2.2	0.59 A @ 14.0V
3457K (major)	40	2.23 A @ 12.8V
3457K (minor)	3	0.59 A @ 14.0V
3757AK (major)	24	2.1 A @ 12.8V
3757AK (minor)	2.2	0.59 A @ 14.0V
4057K (major)	32	2.23 A @ 12.8V
4057K (minor)	2	0.48 A @ 14.0V
4157K (major)	32	2.23 A @ 12.8V
4157K (minor)	3	0.59 A @ 14.0V
W5W	4	0.4 A @ 12.0V

HALOGEN BULB TRADE NUMBER	CANDLE POWER	WATTS @ RATED VOLTAGE
H1	117	55W @ 12.0V
H3	121	55W @ 12.0V
HB2 (9003) (low)	76	55W @ 12.0V
HB2 (9003) (high)	125	60W @ 12.0V
9005 (HB3)	135	65W @ 12.8V
9006 (HB4)	80	55W @ 12.8V
9007 (HB5) (low)	80	55W @ 12.8V
9007 (HB5) (high)	107	65W @ 12.8V
H13/9008 (low)	—	55W @ 12.8V
H13/9008 (high)	—	65W @ 12.8V
H7	125	55W @ 12.0V
H9	167	65W @ 12.0V
H11	107	55W @ 12.8V
H6054 (low)	—	55W @ 12.8V
H6054 (high)	—	65W @ 12.8V
9140	48	40W @ 12.8V
9145 (H10)	65	45W @ 12.8V

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